

UNITED STATES PATENT OFFICE.

GEORGE B. GRANT, OF LEXINGTON, MASSACHUSETTS.

CALCULATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 605,288, dated June 7, 1898.

Application filed February 20, 1895. Serial No. 539,162. (No model.)

To all whom it may concern:

Be it known that I, GEORGE B. GRANT, of Lexington, in the county of Middlesex and State of Massachusetts, have invented certain Improvements in Calculating-Machines, of which the following is a full specification.

This calculating-machine is for the purpose of solving problems in the four cardinal rules of arithmetic—addition, subtraction, multiplication, and division. It belongs to the class of instruments for that purpose that operate by definite mechanical motions and give complete and definite results as distinguished from the class that act by tabular or logarithmic devices.

The object of this invention is the general improvement and simplification of the mechanism.

In the drawings, Figure 1 is a plan of the whole machine. Fig. 2 is a side elevation of the same. Fig. 3 illustrates a detail of the mechanism.

Figs. 1 and 2 show a machine designed to make use of factors of five places and products or dividends of ten places.

On the base 1 are mounted two end frames 2 and 3, and the two tie-rods 4 and 5 are fixed in the frames. The numeral-carriage 6 consists of two frames 7 and 8, which are joined together by the tie-rods 9, 10, and 11 and the rock-shaft 12. The rock-shaft 12 slides in bearings in lugs 13 on the frame 3, permitting a shifting motion from side to side of the numeral-carriage parallel to that rod through a limited distance—here two and a half inches—and also permitting its oscillation a limited amount—here three-sixteenths of an inch—at the rod 9.

The shifting motion of the numeral-carriage 6 is most conveniently effected by means of the shifting handle 14 at the front end of the machine rather than by reaching over to it and moving it by hand. This handle is on a shaft 15, mounted in bearings in the frames 2 and 3. The shaft 15 carries a lever 16 at the back of the machine, from which lever a link 17 connects with the frame 8 of the numeral-carriage, so that by taking hold of the pin 18 on the handle 14 the numeral-carriage 6 may be set anywhere within the limits of its motion. It is necessary in the operation of the machine to move the numeral-carriage

at will to either one of six positions—one at each end of its movement and one at each of four equidistant positions between—and this is accomplished with the assistance of the six pins 19, projecting from the front frame 2 over the handle 14 and close to the pin 18. The hand of the operator easily sets the pin 18 at either one of the pins 19 by touch, and thus places the numeral-carriage 6 in any one of its six positions; but four of these pins 19 are necessary, as the first and last positions of the handle 14 are fixed by its striking the two pins 20.

The oscillation of the numeral-carriage 6 is effected by the cam-lever 21, which is attached to the rock-shaft 22 in the lugs 13 on the frame 3. At its front end it carries a pin 23, working in a cam-groove 24 in the crank-wheel 25, that is rotated on a stud 26 in the post 147 from the base 1 by means of the operating-crank 72. This operating-crank is rotated to the left, and the lever 21 is thus oscillated a distance sufficient to oscillate the numeral-carriage 6 three-sixteenths of an inch at the tie-rod 9. The link 29 fits and slides freely on the tie-rod 10 and is joined to the lever 21 at the pivot-pin 30, being bent to permit adjustment of the numeral-carriage. The spring 31 is attached to the lever 21, and the link 32 draws on it, so as to balance the weight of it and the numeral-carriage, the tension of the spring being regulated by the nut 33.

The position of the numeral-carriage 6 is shown to the eye by the indicator-pin 34, which is set into any fixed part, such as the post 40 in the base 1, the six equidistant positions of the carriage being indicated by the numerals "1," "2," "3," "4," "5," and "6" on the upper surface of the indicator-bar 36, carrying the indicator-wheels 58, as hereinafter described.

The indicator-bar 36 can be oscillated about the tie-rod 37 as a center, and this tie-rod is held in bearings in the arms 38, which are connected by the tie-rod 39 and swing over the ends of the rock-shaft 12 that project from the frames 7 and 8 of the numeral-carriage. The tie-rod 37 slides in the post 40. By this means the indicator-bar 36 is shifted with the numeral-carriage, but does not oscillate with it, and can be given a small oscillation of its